Nonlinear Analysis

Theory, Methods & Applications

Volume 21, 1993

Pergamon Press

Oxford • New York • Seoul • Tokyo

NONLINEAR ANALYSIS
THEORY, METHODS & APPLICATIONS

Editor: Prof. V. Lakshmikantham, Department of Applied Mathematics, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901-6988, USA

Editorial Secretary: Donn Harnish

Honorary Editorial Board

D. G. Kendall, *Cambridge University, Cambridge, UK*
M. A. Krasnoselskii, *Institute of Control Sciences, Moscow, Russia*
J. L. Lions, *Collège de France, Paris 1e, France*
G. I. Marchuk, *Academy of Sciences of the USSR, Moscow, Russia*
Ju. A. Mitropolskii, *Director of the Institute of Mathematics, Ukrainian SSR Academy of Sciences, Repin Street–3, Kiev–4, Ukraine*
L. Nirenberg, *New York University–Courant, New York, NY 10012, USA*
P. A. Samuelson, *MIT, Cambridge, MA, USA*

Associate Editorial Board

R. P. Agarwal, *Department of Mathematics, National University of Singapore, 10 Kent Ridge Crescent, 0511 Singapore*
S. Ahmad, *University of Texas, San Antonio, TX 78249, USA*
H. Amann, *Mathematisches Institut, Universität Zürich, Rämistr. 74, CH-8001 Zürich, Switzerland*
A. Ambrosetti, *Classe di Scienze, Scuola Normale Superiore di Pisa, Piazza Dei Cavalieri 7, 56100, Pisa, Italy*
T. B. Benjamin, *Mathematical Institute, 24–29 St. Giles, Oxford, UK*
H. Brezis, *4 Place Jussieu, Paris, France*
F. E. Browder, *Rutgers University, New Brunswick, NJ, USA*
J. Chandra, *Army Research Office, Durham, NC, USA*
K. C. Chang, *Department of Mathematics, Beijing University, Beijing, People's Republic of China*
P. G. Ciarlet, *Laboratoire d'Analyse Numerique, Tour 55, Université Pierre et Marie Curie, 4 Place Jussieu, F-75005 Paris, France*
F. Clarke, *CRM, University of Montreal, P.O. Box 6128-A, Montreal, Quebec, Canada H3C 3J7*
G. Da Prato, *Classe di Scienze, Scuola Normale Superiore di Pisa, Piazza Dei Cavalieri 7, 56100, Pisa, Italy*
K. Deimling, *Fachbereich 17 der Gesamthochschule, Warburger Strasse 100, D-4790 Paderborn, FRG*
A. Friedman, *Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN 55455, USA*
R. P. Gilbert, *University of Delaware, Newark, DE, USA*
J. Glimm, *Department of Applied Mathematics and Statistics, SUNY at Stony Brook, Stony Brook, NY 11794-0001, USA*
T. G. Hallam, *University of Tennessee, Knoxville, TN 37916, USA*
N. Hirano, *Department of Mathematics, Faculty of Engineering, Yokohama National University, 156 Tokiwadai, Hodogaya, Yokohama 240, Japan*
W. A. Kirk, *Department of Mathematics, University of Iowa, Ames, IA 50011, USA*
P. Kloeden, *School of Computing & Mathematics, Deakin University, Geelong 3217, Victoria, Australia*
S. Leela, *State University of New York at Geneseo, NY, USA*
T. T. Li, *Department of Mathematics, Fudan University, Shanghai, People's Republic of China*
P.-L. Lions, *Université de Paris IX-Dauphine, Place de Lattre-deTassigny, 75775 Paris Cedex 16, France*
K. Masuda, *Department of Mathematics, Faculty of Science, University of Tokyo, Tokyo 113, Japan*
J. Mawhin, *Université Catholique de Louvain, Belgium*
R. May, *Zoology Department, Oxford University, Oxford OX1 3PS, UK*
J. B. McLeod, *Wadham College, Oxford, UK*
A. Myshkis, *Altufevscoy Shosse, Moscow, Russia*
C. Olech, *Instytut Matematyczny PAN, Warszawa, Poland*
W. Petryshyn, *Department of Mathematics, Rutgers University, New Brunswick, NJ 08903-2101, USA*
P. H. Rabinowitz, *Mathematics Department, University of Wisconsin–Madison, Van Vleck Hall, 480 Lincoln Drive, Madison, WI 53706, USA*
W. C. Rheinbolt, *Department of Mathematics & Statistics, University of Pittsburgh, Pittsburgh, PA 15260, USA*
M. Scott, *Boeing Computer Services, PO Box 240002, Huntsville, AL 35824, USA*
P. E. Sobolevskii, *Institute of Mathematics, The Hebrew University, Givat Ramm, 91904 Jerusalem, Israel*
R. Temam, *Université de Paris XI, 91405 Orsay, France*
W. Walter, *Universität Karlsruhe, 75 Karlsruhe, FRG*
E. Zeidler, *Sektion Mathematik, Universität Leipzig, Karl Marx Platz 10, 7010 Leipzig, FRG*

Publishing and Advertising Offices

Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK (Tel (0865) 794141; Telex 83177; Fax (0865) 60285).

Subscription Rates

Annual Institutional Subscription Rates 1994: North, Central and South America, US $1455, Rest of World £945. Associated Personal Subscription Rates are available on request for those whose institutions are library subscribers. Sterling prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice.

Back Issues of all previously published volumes, in both hard copy and on microform, are available direct from Pergamon Press offices.

Published semi-monthly (two issues per month, two volumes 1993)

Copyright © 1993 Pergamon Press Ltd

Second-class postage paid at RAHWAY NJ and additional mailing offices. Postmaster send address corrections to Nonlinear Analysis, c/o Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, USA.

Volume Contents

Volume 21 Number 1

A. V. LAIR	1	Finite extinction time for solutions of nonlinear parabolic equations
TS. TSACHEV and V. G. ANGELOV	9	Fixed points of nonself-mappings and applications
K. NISHIHARA	17	Decay properties of solutions of some quasilinear hyperbolic equations with strong damping
J. R. GRAEF, P. W. SPIKES and M. K. GRAMMATIKOPOULOS	23	Asymptotic behavior of nonoscillatory solutions of neutral delay differential equations of arbitrary order
G. GORNI	43	A criterion of invertibility in the large for local diffeomorphisms between Banach spaces
E. FEIREISL	49	Strong decay for wave equations with nonlinear nonmonotone damping
D. B. HENRY, A. PERISSINITTO JR and O. LOPES	65	On the essential spectrum of a semigroup of thermoelasticity
MI AI PARK	77	On the Rosenau equation in multidimensional space

Volume 21 Number 2

J.-P. PENOT	87	On the convergence of subdifferentials of convex functions
M. BLÁZQUEZ and E. TUMA	103	Chaos in infinite dimensions: a generalization of a theorem of Sil'nikov
P. R. POPIVANOV and D. K. PALAGACHEV	123	Boundary value problem with a tangential oblique derivative for second order quasilinear elliptic operators
L. E. BOBISUD	131	The disintegrating bar: reaction–diffusion in a moving medium
C. Y. CHAN and D. T. FUNG	143	Quenching for coupled semilinear reaction–diffusion problems

Y. ZHANG 153 Existence of solutions of a kind of singular boundary value problem

A. CAÑADA 161 A note on the existence of global minimum for a noncoercive functional

Volume 21 Number 3

L. PISANI 167 Periodic solutions with prescribed energy for singular conservative systems involving strong forces

CUI SHANGBIN 181 Positive solutions for Dirichlet problems associated to semilinear elliptic equations with singular nonlinearity

KIN MING HUI 191 Asymptotic behaviour of solutions of $u_t = \Delta u^m - u^p$ as $p \to \infty$

ZONG-YI HOU and HE-NONG LI 197 The general Arcangeli's method for solving ill-posed problems

J. APPELL, V. LAKSHMIKANTHAM, NGUYEN VAN MINH and P. P. ZABREIKO 207 A general model of evolutionary processes. Exponential dichotomy—I

J. APPELL, V. LAKSHMIKANTHAM, NGUYEN VAN MINH and P. P. ZABREIKO 219 A general model of evolutionary processes. Exponential dichotomy—II

Y. YAMADA 227 Asymptotic behavior of solutions for semilinear Volterra diffusion equations

Volume 21 Number 4

E. N. BARRON, R. JENSEN and J. L. MENALDI 241 Optimal control and differential games with measures

R. MANÁSEVICH and F. ZANOLIN 269 Time-mappings and multiplicity of solutions for the one-dimensional p-Laplacian

DANG DINH HAI and K. SCHMITT 293 Boundary value problems for higher order nonlinear differential equations

J. R. ANDERSON 307 Spontaneous bifurcation for the convective porous medium equation with a nonlinear source

Volume 21 Number 5

A. C. LAZER and P. J. MCKENNA	327	On a problem of Bieberbach and Rademacher
J. J. L. VELÁZQUEZ	337	Global existence and quenching for a model of adiabatic shear band formation
R. NATALINI	349	Unbounded solutions for conservation laws with source
E. ROVDEROVÁ	363	Number of solutions of boundary value problems
J. E. FRANKE and A.-A. YAKUBU	369	Species extinction using geometry of level surfaces
W. B. LIU and J. W. BARRETT	379	A further remark on the regularity of the solutions of the p-Laplacian and its applications to their finite element approximation
S. A. GOURLEY and N. F. BRITTON	389	On a modified Volterra population equation with diffusion
FU-HSIANG WONG	397	Existence of positive solutions of singular boundary value problems

Volume 21 Number 6

S. ROBINSON	407	Double resonance in semilinear elliptic boundary value problems over bounded and unbounded domains
XINFU CHEN and FAHUAI YI	425	Regularity of the free boundary of a continuous casting problem
W. RUAN	439	Asymptotic behavior and positive steady-state solutions of a reaction–diffusion model with autocatalysis and saturation law
H.-P. HEINZ	457	Existence and gap-bifurcation of multiple solutions to certain nonlinear eigenvalue problems

Volume 21 Number 7

LU YUNGUANG, ZHU CHANGJIANG and ZHAO HUIJIANG	485	Viscous solutions of quadratic conservation laws with umbilic points
T. KUCZUMOW, S. REICH, M. SCHMIDT and A. STACHURA	501	Strong asymptotic normal structure and fixed points in product spaces

A. G. KARTSATOS and KI-YEON SHIN — 517 — Solvability of functional evolutions via compactness methods in general Banach spaces

A. NOWAKOWSKI and A. ROGOWSKI — 537 — Periodic solutions in the calculus of variations and differential equations

M. M. COCLITE — 547 — On a singular nonlinear Dirichlet problem—III

Volume 21 Number 8

H. R. CRIPPA — 565 — On local solutions of some mildly degenerate hyperbolic equations

A. LINNÉR — 575 — Existence of free nonclosed Euler–Bernoulli elastica

J. RODRIGUEZ — 595 — An existence analysis for nonlinear operator equations using finite dimensional approximations

A. YAGI — 603 — Global solution to some quasilinear parabolic system in population dynamics

E. S. NOUSSAIR, C. A. SWANSON and YANG JIANFU — 631 — A barrier method for mean curvature problems

Volume 21 Number 9

A. AMBROSETTI, V. BENCI and YIMING LONG — 643 — A note on the existence of multiple brake orbits

L. E. PAYNE — 651 — Continuous dependence on spatial geometry for solutions of the Navier–Stokes equations backward in time

T. J. HEALEY and H. KIELHÖFER — 665 — Separation of global solution branches of elliptic systems with symmetry via nodal properties

P. D'ANCONA — 685 — Local existence for semilinear weakly hyperbolic equations with time dependent coefficients

H. ATTOUCH, A. MOUDAFI and H. RIAHI — 697 — Quantitative stability analysis for maximal monotone operators and semi-groups of contractions

Volume 21 Number 10

D. BLANCHARD — 725 — Truncations and monotonicity methods for parabolic equations

J.-M. ROQUEJOFFRE — 745 — Mathematical analysis of a planar flame model with nonlinear diffusion

J. SOCOLOWSKY 763 The solvability of a free boundary problem for the stationary Navier–Stokes equations with a dynamic contact line

V. LAKSHMIKANTHAM and J. VASUNDHARA DEVI 785 Strict stability criteria for impulsive differential systems

M. FILA and H. A. LEVINE 795 Quenching on the boundary

Volume 21 Number 11

J. SUGIE 803 Some criteria of the existence of limit cycles for a planar system of Liénard type

J. HASLINGER and A. KLARBRING 815 Shape optimization in unilateral contact problems using generalized reciprocal energy as objective functional

E. FERNÁNDEZ-CARA and J. REAL 835 On a conjecture due to J. L. Lions

W. C. RHEINBOLDT 849 On the theory and error estimation of the reduced basis method for multi-parameter problems

R. P. GILBERT and GUO CHUN WEN 859 Two free boundary problems occurring in planar filtrations

X. Q. YANG 869 Vector variational inequality and its duality

Volume 21 Number 12

A. BAGCHI and R. R. MAZUMDAR 879 On Radon–Nikodym derivatives of finitely-additive measures induced by nonlinear transformations on Hilbert space

FU WANTAO and ZHOU KUNPING 903 Connectedness of the efficient solution sets for a strictly path quasiconvex programming problem

K. HACKL 911 On the genericity of a bifurcation point of infinite type and multiple solutions of an elastic membrane

P. J. RABIER 925 On global diffeomorphisms of Euclidian space

M. S. BERGER and Y. Y. CHEN 949 Forced quasiperiodic and almost periodic solution for non-linear systems

I Title Page, Volume Contents and Author Index, Volume 21, 1993

Author Index

Ambrosetti, A. 643
Anderson, J. R. 307
Angelov, V. G. 9
Appell, J. 207, 219
Attouch, H. 697

Bagchi, A. 879
Barrett, J. W. 379
Barron, E. N. 241
Benci, V. 643
Berger, M. S. 949
Blanchard, D. 725
Blázquez, M. 103
Bobisud, L. E. 131
Britton, N. F. 389

Cañada, A. 161
Chan, C. Y. 143
Chen, Y. Y. 949
Coclite, M. M. 547
Crippa, H. R. 565
Cui Shangbin 181

D'Ancona, P. 685
Dang Dinh Hai 293

Fahuai Yi 425
Feireisl, E. 49
Fernández-Cara, E. 835
Fila, M. 795
Franke, J. E. 369
Fu-hsiang Wong 397
Fung, D. T. 143
Fu Wantao 903

Gilbert, R. P. 859
Gorni, G. 43
Gourley, S. A. 389
Graef, J. R. 23
Grammatikopoulos, M. K. 23
Guo Chun Wen 859

Hackl, K. 911
Haslinger, J. 815
Healey, T. J. 665
Heinz, H.-P. 457
He-nong Li 197
Henry, D. B. 65

Jensen, R. 241

Kartsatos, A. G. 517
Kielhöfer, H. 665
Kin Ming Hui 191
Ki-Yeon Shin 517
Klarbring, A. 815
Kuczumov, T. 501

Lair, A. V. 1
Lakshmikantham, V. 207, 219, 785
Lazer, A. C. 327
Levine, H. A. 795
Linnér, A. 575
Liu, W. B. 379
Lopes, O. 65
Lu Yunguang 485

Manásevich, R. 269
Mazumdar, R. R. 879
McKenna, P. J. 327
Menaldi, J. L. 241
Mi Ai Park 77
Moudafi, A. 697

Natalini, R. 349
Nguyen Van Minh 207, 219
Nishihara, K. 17
Noussair, E. S. 631
Nowakowski, A. 537

Palagachev, D. K. 123
Payne, L. E. 651
Penot, J.-P. 87
Perissinitto Jr, A. 65
Pisani, L. 167
Popivanov, P. R. 123

Rabier, P. J. 925
Real, J. 835
Reich, S. 501
Rheinboldt, W. C. 849
Riahi, H. 697
Robinson, S. 407
Rodriguez, J. 595
Rogowski, A. 537
Roquejoffre, J.-M. 745
Rovderová, E. 363
Ruan, W. 439

Schmidt, M. 501
Schmitt, K. 293
Socolowsky, J. 763
Spikes, P. W. 23
Stachura, A. 501
Sugie, J. 803
Swanson, C. A. 631

Tsachev, Ts. 9
Tuma, E. 103

Vasundhara Devi, J. 785
Velázquez, J. J. L. 337

Xinfu Chen 425

Yagi, A. 603
Yakubu, A.-A. 369
Yamada, Y. 227
Yang Jianfu 631
Yang, X. Q. 869
Yiming Long 643

Zabreiko, P. P. 207, 219
Zanolin, F. 269
Zhang, Y. 153
Zhao Huijiang 485
Zhou Kunping 903
Zhu Changjiang 485
Zong-yi Hou 197